

# STRUCTURAL RESEARCH LABS:

## Safety Standard Operating Procedures



**IOWA STATE UNIVERSITY**  
Department of Civil, Construction and Environmental Engineering

## SAFETY OPERATING PROCEDURES

# Horizontal Metal Bandsaw

**DO NOT use this machine unless you have been trained in its safe use and operation and given permission.**



Safety glasses must be worn at all times in work areas.



Appropriate footwear with substantial uppers must be worn.



Loose jewellery must not be worn.



Long and loose hair must be contained.



Close fitting/protective clothing must be worn.



Hearing protection may be required for some operations.

### PRE-OPERATIONAL SAFETY CHECKS

- Ensure no slip/trip hazards are present in workspaces and walkways.
- Check that all guards are in position.
- Ensure hydraulic damping mechanism functions.
- Check that the blade is in good condition.
- Ensure that blade speed, blade tension and blade tracking are properly adjusted.
- Check coolant delivery system to allow for sufficient flow of coolant.
- Locate and ensure you are familiar with the operation of the ON/OFF starter and E-Stop (if fitted).
- Faulty equipment must not be used. Immediately report suspect machinery.

### OPERATIONAL SAFETY CHECKS

1. Lift the head of unit up and lock it in the upward position.
2. Set the angle of the vice, or check it to ensure its squareness.
3. Clamp work piece firmly into the vice. Long material must be supported.
4. Adjust blade guards to cover unused portion of blade.
5. Ensure hands are away from the blade, and then turn the machine on.
6. Allow the upper head assembly to come down slowly until the teeth are cutting the material.
7. Keep hands away from the point of operation during cutting.
8. Turn off the machine and bring it to a complete standstill if the blade is to be lifted out of an uncompleted or jammed cut.
9. Stop the machine and bring it to a complete standstill before removing scrap pieces from the vice area or making adjustments.
10. Stop the saw immediately if the blade develops a 'click'. Report it to your teacher.
11. Ensure the cutting head is locked in the upward position before removing work piece from vice.

### HOUSEKEEPING

1. Switch off the saw and reset all guards to a fully closed position.
2. Leave the machine in a safe, clean and tidy state.

### FORBIDDEN

- Pushing down on the cutting head while it is cutting
- Leaving the machine running unattended

## SAFE OPERATING PROCEDURES

# Bandsaw

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Long and loose hair must be contained.



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Close fitting/protective clothing must be worn.



Loose jewellery must not be worn.



Hearing protection may be required for some operations.

### PRE-OPERATIONAL SAFETY CHECKS

- Ensure no slip/trip hazards are present in workspaces and walkways.
- Locate and ensure you are familiar with the operation of the ON/OFF starter and E-Stop (if fitted).
- Check that all guards are in position.
- Ensure push stick is available.
- Lower the blade guide and guard to full effect.
- Faulty equipment must not be used. Immediately report suspect machinery.

### OPERATIONAL SAFETY CHECKS

**Keep fingers off the line of the cut at all times**

- Never leave the machine running unattended.
- The work piece should be fed forward evenly and held firmly on the table to ensure effective control during cutting whilst keeping hands in a safe position.
- Use a push stick when feeding material past the blade.
- Do not force a wide blade on a cut of small radius. Use relief cuts when cutting sharp curves.
- Before making adjustments switch off the saw and bring the machine to a complete standstill.
- Stop the machine before attempting to back the work away from the blade.
- Stop the saw immediately if the blade develops a 'click'. Report it to your teacher.

### HOUSEKEEPING

- Switch off the saw and reset all guards to a fully closed position.
- Leave the machine in a safe, clean and tidy state.

### FORBIDDEN

- Attempting to cut very small items

## SAFETY OPERATING PROCEDURE

# Forklift Truck

**This vehicle is not for student use**



### PRE-OPERATIONAL SAFETY CHECKS

- Check brakes, lights and horn before use.
- Ensure seat belt/safety restraint is in good condition.
- Know the capacity of the forklift or lift truck before using it. Do not use a forklift without a load rating plate.
- Always remember the Safe Working Load of a forklift reduces as the mast is tilted forward.
- Ensure that the lifting forks are in sound condition and centred either side of the mast.
- Check tyre pressures. Never drive with a flat or under-inflated tyre.
- Faulty equipment must not be used. Report any faults immediately.

### OPERATIONAL SAFETY CHECKS

- Do not use engine-powered forklifts in poorly ventilated areas.
- Always be on the lookout for pedestrians.
- Do not allow any person to ride on the forks.
- Ensure that the lifting tines are secure into the pallet and the load is stable before lifting or driving off.
- Be careful of ceiling clearance or overhead obstructions when raising the mast.
- Do not lift a load with the mast tilted forward.
- Always put the heavy end of the load against the load backrest.
- Never travel with the load elevated as it restricts vision.
- When approaching a blind corner, use horn and drive slowly.
- Always have someone guide you if a load restricts your vision.
- Slow down when changing direction or on wet or greasy surfaces.
- Do not travel with forks raised or reach mechanism extended.
- Avoid harsh braking, especially when carrying a load.
- Do not attempt to turn on an incline or sloping surface.
- Do not leave forks elevated when forklift is unattended.
- Do not dismount from a forklift while the engine is running unless the transmission is in park position and the parking brake is effectively engaged.
- When stopping the forklift:
  - Park on even ground and lower the forks to the ground.
  - Shift the gear selector to park position and apply the parking brake.
  - Turn off the ignition and remove the keys.

### REFUELLING & BATTERIES

1. Do not refuel an engine-powered forklift unless the motor is stopped and ignition turned off.
2. For gas powered vehicles change gas bottles in a well-ventilated area clear of a naked flame or source of ignition.



## SAFE OPERATING PROCEDURES

# Pedestal Grinder

**DO NOT use this machine unless you have been trained in its safe use and operation and given permission.**



Safety glasses must be worn at all times in work areas.



Appropriate footwear with substantial uppers must be worn.



Loose jewellery must not be worn.



Long and loose hair must be contained.



Close fitting/protective clothing must be worn.



Hearing protection must be used when using this machine.

**Only one person may operate this machine at any one time.**

### PRE-OPERATIONAL SAFETY CHECKS

- Check workspaces and walkways to ensure no slip/trip hazards are present.
- Ensure all guards and safety shields are in position before starting the grinder.
- Ensure that the wheels do not touch the work rest and that the gap between wheel and rest is no greater than 1.5mm (1/16").
- Check that wheels are running true and are not glazed or loaded.
- Locate and ensure you are familiar with the operation of the ON/OFF starter.
- Faulty equipment must not be used. Immediately report any suspect machinery.

### OPERATIONAL SAFETY CHECKS

- Stand to the side of the wheels when starting up.
- Let the wheels gain maximum speed before starting to grind.
- Do not grind on the side of the wheel.
- Small objects must not be held by hand.
- Never leave the machine running unattended.
- Do not bend down near the machine whilst it is running.
- Never force the workpiece against a wheel.
- Slowly move the workpiece across the face of the wheel in a uniform manner.
- Coolant spilt on the floor should be immediately absorbed.

### HOUSEKEEPING

- Switch off the machine.
- Leave the machine in a safe, clean and tidy state.

### POTENTIAL HAZARDS

- |                |                                       |                |                         |
|----------------|---------------------------------------|----------------|-------------------------|
| ■ Hot Metal    | ■ Sparks                              | ■ Noise        | ■ Sharp edges and burrs |
| ■ Entanglement | ■ Wheels 'run on' after switching off | ■ Eye injuries |                         |

### FORBIDDEN

- Workpiece must never be held with gloves, cloth, apron or pliers
- Grinding non-ferrous metals

## SAFE OPERATING PROCEDURES

# Oxy-Fuel Gas Welding

**DO NOT use this equipment unless you have been trained in its safe use and operation and are given permission.**



Welding goggles must be worn at all times in work areas.



Long and loose hair must be contained.



Appropriate footwear with substantial uppers must be worn.



Close fitting/protective clothing must be worn.



Loose jewellery must not be worn.



Oil free leather gloves must be worn when welding.

### PRE-OPERATIONAL SAFETY CHECKS

- Ensure no slip/trip hazards are present in workspaces and walkways.
- Keep area clean and free of grease, oil and other flammable material.
- Gas hoses must be in good condition and not create a tripping hazard.
- Before lighting up make a visual inspection of all equipment for damage.
- Check that the area is well ventilated.

**DO NOT use faulty equipment - Report this immediately**

### PRESSURE SETTING

- Check that the oxygen and acetylene regulator adjusting knobs are loose.
- Check that both blowpipe valves are closed.
- Slowly open the cylinder valves on each cylinder for half a turn only.
- Screw in the regulator adjusting knobs slowly until the delivery pressure gauges register 70kPa.
- Purge and check for constant oxygen gas flow.
  - Open the oxygen blowpipe for 2 seconds valve and check the delivery gauge.
  - If necessary re-adjust the oxygen regulator to achieve a 70kPa pressure.
  - Close the oxygen blowpipe valve.
- Purge and check for constant acetylene gas flow.
  - Open the acetylene blowpipe valve for 2 seconds and check the delivery gauge.
  - If necessary re-adjust the acetylene regulator to achieve a 70kPa pressure.
  - Close the acetylene blowpipe valve.

### LIGHTING UP

1. Open the acetylene blowpipe valve slightly and light the blowpipe with a flint lighter.
2. Continue to slowly open the acetylene valve until the flame no longer produces soot.
3. Slowly open the oxygen blowpipe valve until a neutral flame is produced.

# SAFE OPERATING PROCEDURES

## Oxy-Fuel Gas Welding

**DO NOT use this machine unless you have been trained in its safe use and operation and given permission.**



Welding goggles must be worn at all times in work areas.



Sturdy footwear must be worn at all times in work areas.



Rings and jewellery must not be worn.



Long and loose hair must be contained.



Close fitting/protective clothing must be worn.



Oil free leather gloves must be worn when welding.

### SHUTTING OFF BLOWPIPE

- Close the acetylene blowpipe valve first.
- Then close the oxygen blowpipe valve.

### CLOSING DOWN

- Close down both cylinder valves.
- Open oxygen blowpipe valve to allow the gas to drain out.
- When oxygen gauges read zero, unscrew regulator-adjusting knob.
- Close oxygen blowpipe valve.
- Turn off acetylene cylinder valve.
- Open acetylene blowpipe valve and release gas.
- When acetylene gauges read zero, release regulator adjusting knob.
- Close acetylene blowpipe valve.

### HOUSEKEEPING

- Hang up welding blowpipe and hoses.
- Turn off fume extraction.
- Leave the work area in a safe, clean and tidy state.

### POTENTIAL HAZARDS

- Burns
- Flying sparks
- Fumes
- Flashbacks
- Radiation damage to eyes
- Explosion by gas leakage

### FORBIDDEN

- Lighting blowpipe with matches or lighters
- Using oil, grease or other hydrocarbons
- Using oxygen as a substitute for compressed air

## SAFE OPERATING PROCEDURES

# Plasma Cutter

**DO NOT use this machine unless you have been trained in its safe use and operation and given permission.**



Safety glasses must be worn at all times in addition to welding mask.



Appropriate footwear with substantial uppers must be worn.



Respiratory protection devices may be required for some operations.



Hearing protection may be required when cutting thick material.



Long and loose hair must be contained.



Close fitting/protective clothing to cover arms and legs must be worn.



Oil free leather gloves and spats must be worn.



A welding mask with shade number 10 protective filters must be worn.

### PRE-OPERATIONAL SAFETY CHECKS

- Ensure material to be cut poses no hazard. Where possible consult the manufacturers' Safety Data Sheets (SDS) for specific precautionary measures concerning any materials or coatings on materials cut with this equipment.
- Do not weld or cut containers that have held combustible liquids or gases.
- Ensure no slip/trip hazards are present in workspaces and walkways.
- Ensure the work area is clean and clear of grease, oil, and any flammable materials.
- Keep the equipment, work area and gloves dry to avoid electric shocks.
- Ensure the gloves, handpiece and work leads are in good condition.
- Ensure machine is used in a well-ventilated area if not used in a welding bay.
- Ensure the work leads and hoses do not create a tripping hazard.

**DO NOT use faulty equipment - Report this immediately**

### OPERATIONAL SAFETY CHECKS

- Ensure machine is correctly set up for current and airflow.
- Ensure work return cables make firm contact to provide a good electrical connection.
- Metals coated with or containing materials that emit toxic fumes should not be heated or cut unless coating is removed from the work surface.
- Do not leave the plasma cutter running unattended.

### HOUSEKEEPING

- Switch off the machine and fume extraction (where used).
- Turn off air supply and hang up handpiece, hose and welding cables.
- Leave the work area in a safe, clean and tidy state.

### POTENTIAL HAZARDS

- |                   |         |               |                                   |
|-------------------|---------|---------------|-----------------------------------|
| ■ Electric shock  | ■ Noise | ■ Body burns  | ■ Compressed air                  |
| ■ Radiation burns | ■ Fume  | ■ Noxious gas | ■ Flying sparks and falling dross |



## SAFE OPERATING PROCEDURES

# Sander Belt – Disc (Combination)

**DO NOT use this machine unless you have been trained in its safe use and operation.**



Safety glasses must be worn at all times in work areas.



Long and loose hair must be contained or retrained.



Appropriate footwear with substantial uppers must be worn.



Close fitting/protective clothing must be worn.



Loose jewellery must not be worn.



Gloves must not be worn when using this machine.

**Only one person may operate this machine at any one time.**

### PRE-OPERATIONAL SAFETY CHECKS

- Check the workroom and walkways to ensure there are no slip/trip hazards present.
- Ensure you are familiar with the operation of the ON/OFF DOL switch and Emergency Stop.
- Check the sanding disc table is set not more than 2mm (1/16") from disc.
- Check that the finishing belts and discs are both in a serviceable condition.
- Ensure the operator be positioned out of direct line of abrasive belt at all times.
- Faulty equipment must not be used. Immediately report suspect machinery.

### OPERATIONAL SAFETY CHECKS

- Both components of this combination machine should NOT, where possible, be operated simultaneously.
- Allow machine to reach maximum revolutions before operating to avoid overloading.
- Always place material on the table on the downward side of the disc travel to hold it secure on the table surface or belt surface. Never attempt to sand very small items by hand.
- Hold material firmly against stops or table before applying pressure on abrasive disc or belt.
- Keep fingers clear of sanding disc or belt while sanding.
- Never leave the machine while it is running.
- Before making adjustments switch off and bring the machine to a complete standstill.

### HOUSEKEEPING

1. Switch off the machine and leave the floor area in a safe, clean and tidy state.
2. Make sure good housekeeping practices are in place to minimise dust/waste build-up.

### POTENTIAL HAZARDS

- Exposure to moving, abrasive & rotating parts
- Pinch & squash
- Ejected waste
- Excessive wood dust
- Eye injuries
- Burns to skin

### FORBIDDEN:

- Attempting to sand very small items
- Sharpening metal tools

# (ISU Structures Lab) – Safety Operating Procedures

## ABRASIVE CUT OFF SAW

**DO NOT use this machine unless you have been instructed in its safe use and operation and have been given permission**

### PERSONAL PROTECTIVE EQUIPMENT



Safety glasses must be worn at all times in work areas.



Long and loose hair must be contained.



Hearing protection must be worn.



Sturdy footwear must be worn at all times in work areas.



Close fitting/protective clothing must be worn.



Loose jewellery must not be worn.

### PRE-OPERATIONAL SAFETY CHECKS

- ✓ Locate and ensure you are familiar with all machine operations and controls.
- ✓ Ensure all guards are fitted, secure and functional. Do not operate if guards are missing or faulty.
- ✓ Ensure the saw is properly secured to a worktable by bolts/clamps at approximately hip height.
- ✓ Use abrasive cut off wheels with the correct size arbor hole.
- ✓ Use abrasive cut off wheels with a maximum safe operating speed greater than the "no load RPM" marked on the machine's nameplate.
- ✓ Inspect the cut off wheel for chips and cracks.
- ✓ Check workspaces and walkways to ensure no slip/trip-hazards are present.
- ✓ Keep table and work area clear of all tools and off-cut material.

### OPERATIONAL SAFETY CHECKS

- ✓ Ensure all adjustments to machine are secure before making a cut.
- ✓ Use the vice to clamp the work and properly support the over-hanging portion of the workpiece level with the base of the machine.
- ✓ Allow the machine to reach full speed before contacting the workpiece.
- ✓ Ease the abrasive disc against the workpiece when starting to cut.
- ✓ Keep hands away from the blade and cutting area.
- ✓ After finishing the cut, release the switch, hold the saw arm down and wait for the disc to stop before removing work or off-cut piece.
- ✓ Before making any adjustments, disconnect the plug from the power source and bring the machine to a complete standstill.

### CLEANING UP

- ✓ Remove foreign material from in and around ventilation openings and switch levers.
- ✓ Leave the machine in a safe, clean and tidy state.

### POTENTIAL HAZARDS AND INJURIES

- ⓘ Metal sparks.
- ⓘ Noise.
- ⓘ Sharp metal burrs.
- ⓘ Contact with rotating disc.
- ⓘ Eye injuries.
- ⓘ Burns from hot workpieces.

### DON'T

- ✗ Do not use faulty equipment. Immediately report suspect equipment.
- ✗ Do not grind on the side of abrasive cut off wheels.
- ✗ Do not cut wood or wood products.
- ✗ Do not hold a workpiece by hand, as it will become very hot while being cut.
- ✗ Do not use a length stop on the free off-cut end of a clamped workpiece.
- ✗ Do not have any part of your body in line with the path of the abrasive disc.
- ✗ Do not force the tool into a cut.
- ✗ Do not attempt to remove cut material while disc is moving.

**This SOP does not necessarily cover all possible hazards associated with this equipment and should be used in conjunction with other references. It is designed as a guide to be used to compliment training and as a reminder to users prior to equipment use.**

## SAFETY OPERATING PROCEDURES

# Drill Press

**DO NOT use this machine unless you have been trained in its safe use and operation and given permission.**



Safety glasses must be worn at all times in work areas.



Sturdy footwear must be worn at all times in work areas.



Loose jewellery must not be worn.



Long and loose hair must be contained.



Close fitting/protective clothing must be worn.



Gloves must not be worn when using this machine.

### PRE-OPERATIONAL SAFETY CHECKS

- Check workspace and walkways to ensure no slip-hazards are present.
- Ensure the chuck key (if used) has been removed from the drill chuck.
- Locate and ensure you are familiar with the operation of the ON/OFF starter and E-Stop (if fitted).
- Follow correct clamping procedures to ensure work is secure.
- Adjust spindle speed to suit drill or cutter diameter. Adjust while chuck is spinning.
- Faulty equipment must not be used. Immediately report suspect equipment.

### OPERATIONAL SAFETY CHECKS

- Never leave the Drill Press while it is running.
- Before making adjustments or before cleaning swarf accumulations switch off and bring the machine to a complete standstill.
- Feed downwards at a sufficient rate to keep the drill cutting.
- Feed with care as the drill breaks through the underside of the work.
- Use a safe working posture (beware of hair catching).

### HOUSEKEEPING

- Switch off the machine.
- Leave the machine in a safe, clean and tidy state.

### POTENTIAL HAZARDS

- Hair/clothing entanglement - rotating spindle/drill
- Eye injuries
- Flying swarf/chips
- Sharp edges & burrs

This SOP does not necessarily cover all possible hazards associated with the machine and should be used in conjunction with other references  
It is designed to be used as an adjunct to teaching Safety Procedures and to act as a reminder to users prior to machine use

Date of last review

Signature